Siemens
TTY Report
July 10th, 2002

Siemens is investing a significant amount of effort in order to comply with the FCC requirement to support E911 calls made from TTY devices on wireless digital networks.

Network Implementation

Siemens is supporting a BSS based TTY solution. This is a "Transcoder Pooling" solution now referred to as "CTM circuit pooling solution". This solution may be implemented as an external network element on the A- interface or integrated within the TRAU. The Siemens solution will not impact the existing vocoders already deployed and supported by Siemens.

Siemens received the first prototype unit (including the necessary hardware and software) and has completed the internal system testing at our lab in Boca Raton, Fl. Our TTY solution has been deployed to our customer lab and tested for network and handset interoperability.

Handsets Implementation

Siemens Handset group will support TTY in 2002. Siemens will support TTY/CTM via an accessory cable and the handset will support the GSM bearer bit capability for signaling from the handset to the network.

Respectfully submitted,
Ilan Vardi
Siemens

Sony Ericsson Mobile Communications
TTY Forum #22 Report
July 10, 2002

This report details the verbal presentation provided by Sony Ericsson Mobile Communications at the June 06, 2002 TTY Forum 22. The report identifies development and testing status for handset products, release and general availability dates, efforts towards achieving compatibility with TTY devices, system testing, deployment activities, technical issues, and contact information.

Sony Ericsson has completed the development of TTY technology. The handset products are built to the approved relevant standards. The release of acceptance products to the carriers has been completed. In general, the technical feasibility to transport TTY across the digital wireless systems has been proven by the product operability testing. Sony Ericsson has conducted field tests, interoperability tests, and final product verification tests for TTY test capability. Interoperability testing is being conducted within Sony Ericsson, and within the industry test events of TTSI within ATIS. User testing is underway. Education material and field training are underway.

Isolated technical flaws and system integration issues continue to be identified during the testing of TTY products and systems. The isolation and resolution of these issues will require testing at particular deployment sites, where performance has been observed to be an issue. Issues with GAP performance, IS-825 and IS-840 MPS (Minimum Performance Specifications), have been observed, primarily in CDMA infrastructures, while on mobile-to-mobile, and in some instances, mobile-to-land calls.

Sony Ericsson continues to actively develop and test existing and new TTY compatible products, participate and monitor the industry standards and test events, and work closely with the regulatory bodies and the ATIS TTSI Incubator. Sony Ericsson is closely monitoring the data generated by TTSI to determine compliance to the FCC mandated 1% TTY character error rate.

An issue with call completion status messages from the infrastructure to the TTY devices was raised as an issue with the ATIS IVR forum in April. The issue was moved to the IVR forum, which has raised the issue with ANSI. A draft request was created, to develop TTY character messages for "System Busy", "All Circuits Busy", and "The Number Cannot be Completed as Dialed". Characterization of these messages, and completion of the standardization efforts, has received excellent cooperation from all parties involved in this high priority effort.

9) <u>Network Infrastructure Compatibility Evaluation</u> :
TDMA Status:

Sony Ericsson has tested interoperability by testing handsets with Lucent, Nortel, Ericsson, and others infrastructures. The Sony Ericsson T61D and T61LX TDMA handsets function with outstanding performance. The internal HCO/VCO feature has been user tested, and found to work very well.

GSM Status:

Sony Ericsson has tested the interoperability of infrastructures, by testing GSM handsets with Ericsson, Nortel, and Nokia and others infrastructures. The results have been outstanding in stationary and driving conditions. Tests of up to 70 MPH showed no significant error rates. HCO/VCO testing with the Ameriphone Q90D showed excellent results. Subsequent testing of GSM in Washington DC shows less than ideal performance, with mobile-to-mobile calls, with gapped TTY character data. An investigation is underway.

CDMA Status:

Sony Ericsson has tested the interoperability of infrastructures to validate CDMA handsets, with Ericsson, Lucent, and others infrastructures. Sony Ericsson identified and repaired all known issues with the handset design. Sony Ericsson has been able to produce valid test results on Lucent LiveNet and Lucent Infrastructures in Washington DC, and Ericsson CDMA infrastructures in San Diego CA. In interoperability testing with other manufacturers, it has been observed that performance in one city may not match performance in another city. Sony Ericsson has pressed ATIS to step up its role in CDMA infrastructure interoperability testing, to validate gapped character performance with all manufacturers.

10) Handset Development and Testing Plans;

Sony Ericsson TTY terminal products have completed development. Test data has been generated for CDMA, TDMA, and GSM products. Handsets were made available for manufacturer and carrier interoperability testing, and have been used at TTSI test events. The T61D (TDMA), and T61Z (GSM) handsets are commercially available. Soon to be released handset models include the T61C (CDMA) T206 (CDMA) and T68i (GSM).

TDMA Status

The handset performance received an excellent response. The T61D handset is in production.

TDMA Plans

Carrier acceptance test units were released. No known handset issues exist.

GSM Status

Infrastructure testing with ATT Wireless and Cingular are complete. Infrastructure testing with VoiceStream and Airnet are ongoing. The T61Z handset is in production.

GSM Plans

T-Link adapters are available in the Special Needs Center (www.ericsson-snc.com). Additional product development plans are in process.

CDMA Status

There are performance issues with several infrastructures, and in several cities. ATIS has been notified of the apparent issue with GAP testing data and reports. Additional lab and chipset software testing are proceeding. Customer and user testing in selected cities have shown that acceptable performance is possible to TRS centers.

CDMA Plans
Product improvements and new product plans are in process

11) Availability to Carriers of Full Acceptance Test Units;

- *TDMA handset Model T61D and T61LX were in production in June 2002.*
- *GSM handset Model T61z customer shipped in March 2002*
- *CDMA handset T60C customer shipped in March 2002.*

12) Efforts Toward Achieving Digital Wireless Solution Compatibility with Enhanced TTY Devices.

Sony Ericsson continues to work very closely with all manufacturers and carriers on the TTY compatibility mandate.

13) Testing and Deployment Activities

Sony Ericsson is working with the operators/carriers in the test and deployment of network infrastructure systems. In addition Sony Ericsson is working with the ATIS Incubator (TTSI), which continues to hold test events.

Sony Ericsson has been conducting customer education and user trials at SHHH, and NAD Conference events. Sony Ericsson has been working closely with the Sony Ericsson Special Needs Center, and is creating special education material for improving the use and access of its products to the marketplace.

6) Risks:
Performance of interoperability tests with TDMA has been widely successful. Performance of interoperability tests with GSM have been mostly successful, with an isolated failure in Washington DC on one carrier. Performance of interoperability tests with CDMA has been mostly problematic; with wide spread failures in most locations.

CDMA interoperability issues with infrastructures have proven to be an illusive target, even with advanced testing tools. Several infrastructure manufacturers have generated substandard test results when tested in configurations of TRS, 911, Mobile-to-Mobile and Mobile-to-Land, with performance tests of Gallaudet, IS-825, IS-840, IS-733, HCO/VCO, Noise, and GAP configurations. The seemingly good results of Fast Typist may indicate that the echo cancellers in the network systems may not be configured properly in all systems. The test data points to problems on Mobile-to-Mobile calls, where the phones, and other test elements have proven themselves in numerous situations. Interoperability in particular cities, and with certain infrastructures, continues to show isolated issues. Direct work to validate new Gallaudet GAP scripts, with various character constructs, have been undertaken to demonstrate these performance issues exist in TTSI interoperability tests. It is hoped that with additional scrutiny to software configurations and echo canceller parameters, all remaining infrastructures can be brought into compliance.

User tests with TRS systems have show very good results in Seattle TDMA and Washington TDMA CDMA. Additional user testing and reports are in process. Close observation to initial user reports could be helpful in validating system infrastructure compatibility. 911 system testing and compatibility issues have been handed to TTSI for further work, and Sony Ericsson continues to monitor the progress.

Please feel free to contact either Matt Kaltenbach or Steve Coston if you have any question regarding this report, or wish to contact test or product interfaces. Please contact your local customer interface for product sales and marketing information.

Southern LINC®

SOUTHERN COMPANY
Energy to Serve Your World™

Southern LINC® TTY Status Report
2nd Quarter 2002

Southern LINC hereby submits its status report for 2nd Quarter 2002 in accordance with the reporting requirement contained in the Federal Communications Commission's *Fourth Report and Order* in CC Docket No. 94-102. Southern LINC is pleased to report that it completed implementation of TTY capability on its iDEN system in advance of June 30, 2002. This capability enables Southern LINC subscribers to connect TTY-capable handsets to TTY devices and complete calls on Southern LINC's network, including calls to 9-1-1. Southern LINC is a regional carrier providing service in Georgia and Alabama and portions of Florida and Mississippi. Its deployment of the iDEN TTY solution encompasses its entire network, and it currently offers multiple digital handsets that can be used with a TTY device on its system. Specifically, Southern LINC has undertaken the following steps since submitting its 1st Quarter 2002 status report:

- Southern LINC completed installation of all necessary network software upgrades to support TTY call completion.
- Southern LINC conducted testing of the iDEN TTY solution on its network, and all testing was successful. This testing included call-through testing on its network to a PSAP (Calhoun County, AL 9-1-1) using TTY devices connected to its handsets, and these calls were successfully completed. It is Southern LINC's understanding, however, that industry field-testing under the auspices of the Alliance for Telecommunications Industry Solutions-sponsored TTY Technical Standards Implementation (TTSI) Incubator program identified problems with the equipment used by some PSAPs that leads to an unacceptable character error rate for TTY calls. Southern LINC will continue to monitor this situation through the TTY Forum and will remain alert to any 9-1-1 TTY call problems that may arise with PSAPs within its service territory.
- Southern LINC prepared a communications piece for its customers for inclusion with their July bills. The bill insert informs Southern LINC subscribers of the ability to use TTY devices on the Southern LINC system. Southern LINC has also posted information on its Internet site.
- Southern LINC has conducted internal training to ensure that Southern LINC personnel have the necessary information to communicate with customers about using TTY devices to place calls on the Southern LINC system.

For questions regarding this report, please contact:

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TTY Report to the FCC
On Behalf of Sprint PCS and its Network Managers
Prepared 7/10/02

NOTE: In a press release dated June 19, 2002, Sprint PCS announced the nationwide launch of its TTY service and the availability of six (6) TTY capable handsets.

1. ***Network Infrastructure Software Development***
   - Sprint PCS has received software from all of its network vendors. TTY infrastructure and handset interoperability testing has been completed.
   - The TTY feature has been activated in Sprint PCS markets with Lucent, Nortel, Motorola and Samsung infrastructures
   - Sprint PCS has completed additional laboratory testing on the latest iteration of Motorola's TTY solution which is expected to improve TTY performance with particular handsets. The network upgrades are expected to be completed in the August time-frame.
   - Sprint PCS and other wireless carriers have encountered difficulties when testing the TTY feature with PSAPs, which may interfere with the ubiquitous support of the TTY feature in our network. Sprint PCS along with other wireless carriers has brought this matter to the attention of the FCC. With the FCC's approval, Sprint PCS launched TTY despite the PSAP problems. Sprint PCS is educating its customers about the difficulties that may be encountered when dialing 911 and suggest alternate means of making emergency calls (via TRS, analog mode, or landline phone). Sprint PCS will continue to support industry efforts to find a long term solution to the PSAP issue.
2. ***Handset development and testing plans***
   - SPCS has successfully tested handsets provided by five vendors and expect our remaining vendors to deliver TTY capable handsets from this point forth.
   - Interoperability testing with all four infrastructure providers has been performed in a laboratory environment and in a field environment. Laboratory and field-testing will continue through the Sprint PCS nation wide launch and beyond.
   - Sprint PCS has and will likely continue to encounter minor problems with handset models. Sprint PCS is receiving positive cooperation and support from handset vendors to fix the bugs quickly.
3. ***Beta testing and lab testing***
   - SPCS requires lab, field testing, and beta testing (in that order) prior to implementation. Our internal lab testing and field testing are extremely intensive and require approximately two to three months each.
   - Both lab and field testing have been completed.
   - SPCS has participated in the ATIS sponsored TTY Technical Standards Incubator (TTSI) program. Sprint PCS has also performed inter-technology testing with AMPS, TDMA, and CDMA wireless telephony systems yielding results consistent with other TTSI results.
   - SPCS has also completed three live network user trials (beta test) with deaf/hard of hearing user groups.
4. ***Release and general availability to carriers of network software***
   - All network infrastructure vendors have provided software solutions for TTY.
   - All network vendor's software has been released from Sprint PCS' lab and has gone "live" in the markets. Sprint PCS is, as noted above, preparing to launch new, improved Motorola infrastructure that will enhance TTY performance.
5. ***Availability to carriers of full acceptance test units***
   - See # 2
6. ***Efforts toward Achieving digital wireless solution compatibility with enhanced TTY devices.***
   - Sprint PCS is not pursuing a resolution of proprietary enhanced protocols as the FCC has temporarily relieved carriers of this responsibility. Sprint PCS will reevaluate enhanced protocols when industry standards supporting these protocols are in place.
7. ***Carrier Coordination of testing with PSAP***

- While Sprint PCS has performed its own PSAP testing (in which it encountered mixed results), due to the nature of PSAP/E911 testing, it is relying mostly on ATIS' TTSI to coordinate more robust PSAP testing with the help of NENA and APCO.

8. ***Carrier testing activities, including field testing, consumer end-to-end testing***
   - Sprint PCS has testing with a variety of consumers (including Gallaudet University) in various markets prior to nation-wide deployment.
   - Sprint PCS is actively participating in the ATIS TTSI program and will continue to participate in additional "incubator" field tests in which carriers and vendors perform interoperability tests.
   - Sprint PCS was the first American domestic carrier to perform TTSI supported international interoperability testing with participants from another continent (Ericsson CDMA Lab testing in Sao Paulo, Brazil).
   - Sprint PCS was also instrumental in working with ATIS TTSI and Sprint TRS to resolve a compatibility concern between TTY and TRS.
9. ***Retail availability of necessary consumer equipment***
- Several TTY capable handsets are available at Sprint PCS Stores now. The list of phones will increase steadily because Sprint is requiring that nearly all of its new handsets be TTY capable. Lists of available handsets can be found on Sprint PCS' web site. The methods of enabling the TTY feature will be available within handset user guides in the near future.

10. ***Geographic scope of network deployment***
    - SPCS launched nationwide on June 19, 2002. All markets in all geographic areas are up and running.

Unwired Telecom Report to the FCC
Prepared: 6/17/02

1. ***Network Infrastructure Software Development***
   Unwired Telecom operates one Nortel switch and the required MTX 10 software upgrade was completed on June 6, 2002.

2. ***Handset development and testing plans***
   Unwired Telecom currently has a TDMA TTY compatible handset (Panasonic model # EB-TX310) available in stores. We will introduce additional models by the end of July 2002.

3. ***Beta testing and lab testing***
   Beta and lab testing was successfully completed on June 17, 2002.

4. ***Carrier Coordination of testing with PSAP***
   Unwired Telecom completed testing with the Calcasieu Parish, LA Communications District on June 17, 2002.

5. ***Retail availability of necessary consumer equipment***
   TTY capable handsets are now available in all Unwired Telecom stores.

6. ***Geographic scope of network deployment***
   Network deployment was completed on June 17, 2002.

7. ***Efforts toward achieving digital wireless solution compatibility with enhanced TTY devices.***
   Unwired Telecom is not pursuing a resolution of proprietary enhanced protocols as the FCC has temporarily relieved carriers of this responsibility.

8. ***Carrier testing activities, including field-testing and consumer end-to-end testing.***
   Field-testing and consumer end-to-end testing was completed on June 17, 2002.

9. ***Release and general availability to carriers of network software.***
   See # 1

10. ***Availability to carriers of full acceptance test units***
    The test unit used by Unwired Telecom is available from Ultratech.

Global Wireless by T · ·Mobile·

TTY Report for July 2002

VoiceStream Wireless

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Contents

1. Purpose

This document describes VoiceStream's achievement of the FCC mandate, contained in 47 CFR Section 20.18, that operators of digital wireless systems must be capable of transmitting 911 calls from individuals with disabilities through the use of Text Telephone Devices (TTY). The rule requires compliance with this mandate on or before June 30, 2002. The capabilities that VoiceStream has achieved will also support the FCC's policy of full user-to-user functionality for persons with disabilities employing TTY devices. This document, which is for information purposes, is submitted to the TTY Forum of the Alliance for Telecommunications Industry Solutions (ATIS).

2. Executive Summary

VoiceStream uniformly employs the GSM air interface. Standardization work for a GSM TTY solution is complete and VoiceStream was active in facilitating testing and decisions that enabled 911 access as well as full user-to-user functionality. VoiceStream has deployed different solutions, depending on network and handset vendor and equipment type. VoiceStream uses network equipment from Ericsson, Nokia and Nortel in different geographical areas of the US. TTY-capable handsets from Ericsson, Motorola and Nokia are being evaluated. Initially the Ericsson T61z will be provisioned for TTY customers.

VoiceStream was instrumental in working with the global GSM community to get agreement on a common signaling mechanism applicable to both the Network Switching Subsystem (NSS) and Base Station System (BSS) solutions. Having obtained global community agreement on using bearer capability signaling, VoiceStream has been working diligently with its network equipment vendors to test and verify the performance of both the NSS and BSS implementations.

As of June 30, software loads were completed in virtually all of VoiceStream's 42 markets, comprising 359 base station controllers. The single exception comprises four BTAs associated with a license that VoiceStream only recently purchased in south-central Pennsylvania. The network equipment in those four markets is older and requires significant upgrades before it will be capable of supporting TTY. On June 28, 2002, the Commission's Wireless Telecommunications Bureau granted VoiceStream a waiver of the wireless TTY rule for an additional 75 days for the four BTAs. The markets involved serve less than 1.5 percent of VoiceStream's total subscribers.

VoiceStream has contracted with the HITEC Group -- a respected, two-decades old organization that works to help persons with disabilities to obtain assistative technology products -- to manage the distribution of TTY compatible handsets to VoiceStream customers.

3. Background

Since September 1997, the Wireless TTY Forum (TTY Forum), representing wireless carriers, wireless equipment manufacturers, manufacturers of TTY devices, public safety organizations, and consumer organizations representing individuals who are deaf or hard-of-hearing has been meeting in an effort to develop solutions that will enable TTY users to make 911 calls on digital wireless networks. Technical solutions had been proposed for all major wireless standards and these solutions have been undergoing study in the relevant technical bodies, TR45.5 (CDMA), TR45.3 (TDMA) and T1P1/3GPP (GSM).

The GSM solution uses the Cellular Text Telephony Modem (CTM) as a method of transmitting Baudot over the GSM network.

CTM solves the engineering challenge to transmit Baudot code over the digital channel of GSM at the FCC-mandated standard of a 1 percent Total Character Error Rate (TCER), as the digital codecs have been optimized for speech. Baudot uses frequency components at 1.4 and 1.8 KHz, which would have been attenuated by the low pass filtering in the codecs. In addition, the error correcting protocols of GSM normally would have resulted in the character error rate for a Baudot Code transmission increasing dramatically in the case of decreasing channel quality.

For this reason, CTM has been designed to work with all speech coding strategies and it has been successfully tested with the relevant codecs for the US, which are the GSM FR, EFR and all modes of the AMR codec. CTM signals have components only between 400 Hz and 1000 Hz, which corresponds to the natural range of human speech. A converter would handle the CTM functionality at the mobile, which would be either incorporated into the mobile or available as a clip-on/add-on unit.

The three documents specifying CTM have now been approved in the U.S. as American National Standards. These documents have also been submitted to 3GPP and have become the basis for the specifications developed by that group for all GSM systems worldwide.

TTY support in GSM networks has been formalized and is outlined in Technical Specifications-TS 23.002 and TS 23.226. TTY support is enabled using one of three solutions:

- The "all transcoder solution (All-TRAU)" with CTM on every circuit leading out to the terminals.
- The "CTM circuit pool solution" with a mechanism for selecting a circuit leading to the terminal that has the proper CTM detection/conversion capabilities, based on the terminal indicating that it has CTM capabilities.
- The "CTM-SRF [specialized resources function] service node solution" with a service node in the core network and a mechanism to route through it for CTM detection/conversion.

The GSM technical specifications require the support of Bearer Capability Signaling from the handset to the network for both the circuit pooling as well as service node solutions. This solution for a common signaling mechanism allows a handset to signal the network at call setup

that it is sending a CTM call and thus the network can direct that call to a network path that can convert the CTM signal into Baudot.

Because the signaling mechanism is common to both the server as well as the circuit pooling solutions and is transparent to the All-TRAU solution, the wireless system operator can choose the equipment option that best fits its equipment implementation yet still maintain interoperability across platforms. The signaling mechanism is totally transparent to the user – that is, a TTY call can be made by any CTM-capable handset regardless of the network implementation utilized by the wireless system operator.

4. VoiceStream's Network Progress

VoiceStream has issued Purchase Orders totaling approximately $5.5 million directly attributable to the initial deployment of TTY. Additional funds have been budgeted to cover any additional costs associated with the testing and deployment phases. VoiceStream has firm technical and commercial support from all three of its network equipment vendors.

Each vendor has chosen a slightly different implementation option based on its analysis of the ease and speed of the particular deployment solution.

Nokia	Implementing the All-TRAU solution which requires a software upgrade to all transcoder units. The software to support CTM/TTY is part of the company's S.10 release.
Nortel	Supporting the All-TRAU solution on the BSC E3 platform using the TCU E3 transcoder. CTM/TTY is supported in release 13.2. For the BSC 2G, Nortel is supporting the CTM circuit pooled solution requiring release 12.4D+.
Ericsson	Implementing the Service Node solution, using Telegent (Sweden) servers. The new servers are supported by the R9 BSC and MSC software releases.

Irrespective of the implementation option chosen by the vendor, the process for testing the CTM/TTY functionality proceeded as outlined below.

Laboratory Functional Testing (LFT) - Testing of the CTM functionality as a stand-alone function was performed in a controlled environment. The aim of this testing was to confirm that the CTM translation is correct and that the CTM/TTY functionality is able to meet the defined GSM and FCC requirements.

Laboratory Acceptance Tests (LAT) - Testing of the full end-to-end functionality of the new software and hardware needed to support TTY, including regression tests of basic GSM features such as voice call completion, GPRS call completion etc, to ensure that software changes did not introduced unforeseen errors in other blocks of code.

Soak Test (ST) - A stability period to ensure that software and hardware was stable and is able to operate in a normal loaded condition.

First Office Application (FOA) - Limited deployment in the live network, to ensure that no unforeseen problems occurred that was not be observed in the laboratory.

General Acceptance (GA) - Full deployment to all relevant network nodes.

The table below shows the start dates for each of the phases of the test and verification program. The program shows the testing dates and the initiation of national deployment (GA).

Table 1: Test and Verification Dates

	LFT	LAT	ST	FOA	GA
Nokia	01/24/02	02/18/02	04/22/02	04/15/02	06/28/02
Nortel 2G BSC	04/01/02	04/11/02	04/18/02	05/01/02	06/28/02
Ericsson	01/26/02	02/15/02	02/25/02	03/27/02	05/15/02

Testing and verification has included end-to-end testing with a selection of PSAPs in various markets. In the course of the testing, VoiceStream engineers used various combinations of available TTY equipment such as the Compact C and TextLink 9100 TTY keyboards, the Ericsson 300z and T61z, Motorola P280i, and Nokia Gate mobile phones. The scoring of transmissions was done with Gallaudet software running on laptop PCs. While conducting the tests, VoiceStream was able to transmit those calls to the PSAP, although problems did arise due to the inability of some PSAPs to process the calls.

5. VoiceStream's Handset Availability

TTY-capable handsets interoperable over all infrastructures will be available upon customer request. VoiceStream has contracted with the HITEC Group to provision TTY capable phones to our subscribers. HITEC also has the ability to provide additional TTY equipment that is compatible with the TTY capable phones. The Ericsson T61z TTY-capable handset will be provisioned to customers. HITEC is a well-known organization with a history of working with persons with disabilities by provisioning a wide range of assistive communications devices. HITEC will ship the necessary equipment directly to the customer. The shipment will include a VoiceStream customer contract. Upon receiving a signed contract from the customer at a VoiceStream retail store, VoiceStream will activate the customer's service.

6. Conclusion

Voicestream has met the June 30, 2002 deadline for provision of wireless TTY access to 911 emergency services, consistent with the Commission's mandate and the June 28, 2002 waiver providing the limited additional time necessary for compliance in one small geographic area. . VoiceStream cautions, however, that some concerns remain concerning the ability of Public Safety Answering Points (PSAPs) to process wireless 911 TTY calls. These processing problems manifest in relatively high character error rates. As documented by the ATIS-sponsored TTY Technical Standards Implementation (TTSI) Incubator, the problem may be limited to older, non-standardized TTY equipment and software used by some PSAPs.